

REMARKS

Claim 1 has been amended and claims 24-34 have been added.

The amendment to claim 1 corrects a typographical error.

Support for the addition of claims 24-34 can be found throughout the specification.

For example, Example 3 discloses a membrane comprising sPEEK, PVI and an elastomeric copolymer of acrylonitrile and vinylimidazole which was treated with 1M H₂SO₄ at room temperature overnight. See page 14, line 25-26. Example 4 also discloses the treatment of a membrane with 1M H₂SO₄ at room temperature overnight wherein the membrane comprises sPEEK and an elastomeric copolymer of acrylonitrile and vinylimidazole. Similarly, Example 5 discloses the preparation of a membrane comprising polyvinylimidazole and an elastomeric copolymer comprising elastomeric and acidic subunits which is treated with sulfuric acid at room temperature overnight. See also Examples 6-9, as well as Examples 24 and 25.

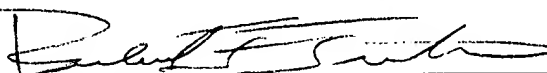
Additional support can be found in the claims as originally filed wherein polyvinylimidazole is disclosed as a basic polymer (claim 5); vinylimidazole is claimed as a basic subunit (claims 9 and 10), and claims 13-23 wherein various membrane electrode assemblies, electrochemical devices, and fuel cells electronic devices and methods are claimed.

The Commissioner is authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 06-1300 (Our Order No. A-70610/RFT).

Respectfully submitted,

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CLAIMS SHOWING AMENDMENTS MADE

1. (Amended) A polymer membrane comprising a first polymer comprising acidic subunits and a second polymer comprising basic subunits, wherein (i) at least one of said first or second polymers is an elastomeric copolymer further comprising elastomeric subunit, or (ii) the polymer membrane further [comprising] comprises an elastomeric polymer comprising elastomeric subunits.
2. The polymer membrane of claim 1 wherein said first polymer comprises sulfonic acid, phosphoric acid or carboxylic acid groups.
3. The polymer membrane of claim 2 wherein said first polymer comprises sulfonated polyetherether ketone sulfonated polyetherether sulfone.
4. The polymer membrane of claim 1 wherein said second polymer comprises an aromatic amine, an aliphatic amine or a heterocyclic nitrogen.
5. The polymer membrane of claim 4 wherein said second polymer comprises polybenzimidazole or polyvinylimidazole.
6. The polymer membrane of claim 1 wherein said elastomeric polymer comprises a semi-interpenetrating network in said membrane.
7. The polymer membrane of claim 1 wherein said elastomeric polymer comprises polyacrylonitrile.
8. The polymer membrane of claim 1 wherein said elastomeric copolymer comprises an elastomeric subunit comprising acrylonitrile.
9. The polymer membrane of claim 1 wherein said first polymer comprises sulfonated polyetherether ketone, and said elastomeric copolymer comprises basic subunits comprising vinylimidazole and elastomeric subunits comprising acrylonitrile.
10. The polymer membrane of claim 1 wherein said second polymer comprises polyvinylimidazole and said elastomeric polymer comprises acidic subunits comprising 2-acrylonamide-2-methyl-1 propane sulfonic acid and elastomeric subunits comprising acrylonitrile.
11. The polymer membrane of claim 1 wherein said membrane is permeable to protons.
12. The polymer membrane of claim 1 wherein said membrane is substantially impermeable to methanol.

13. A membrane electrode assembly comprising the polymer membrane of claim 1 and first and second catalysts positioned respectively on first and second opposite surfaces of said membrane.
14. A membrane electrode assembly of claim 13 further comprising a cathode electrode and an anode electrode, wherein each of said electrodes is separately in electrical communication with said first and said second catalysts.
15. An electrochemical device comprising the polymer membrane of claim 1.
16. The electrochemical device of claim 15 comprising a battery.
17. A fuel cell comprising the polymer electrolyte membrane of claim 1.
18. A fuel cell comprising the membrane electrode assembly of claim 13 or 14.
19. An electronic device comprising the electrochemical device of claim 15.
20. An electronic device comprising the fuel cell of claim 17 or 18.
21. A method for forming the polymer membrane of claim 1 comprising combining at least one of said first polymer or said second polymer with said elastomeric polymer or said elastomeric copolymer.
22. A method for forming a membrane electrode assembly comprising contacting each of the opposite surfaces of the membrane of claim 1 with a composition comprising one or more catalysts to form cathode and anode catalyst layers.
23. The method of claim 22 further comprising electrically contacting said cathode and anode catalysts with anode and cathode electrodes.
- 24. (New) A method for forming a polymer membrane suitable for use as a membrane electrode assembly comprising treating a polymer membrane with sulfuric acid at room temperature wherein said polymer membrane comprises a first polymer comprising acidic subunits and a second polymer comprising basic subunits, wherein (i) at least one of said first or second polymers is an elastomeric copolymer further comprising elastomeric subunit, or (ii) the polymer membrane further comprises an elastomeric polymer comprising elastomeric subunits.
25. (New) The method of claim 24 wherein the basic subunits of said second polymer comprise polyvinylimidazole.
26. (New) A polymer membrane made according to the method of claim 24.

27. (New) A polymer membrane suitable for use in a membrane electrode assembly comprising a first polymer comprising acidic subunits and a second polymer comprising vinylimidazole subunits, wherein (i) at least one of said first or second polymers is an elastomeric copolymer further comprising elastomeric subunit, or (ii) the polymer membrane further comprises an elastomeric polymer comprising elastomeric subunits.
28. (New) A membrane electrode assembly comprising the polymer membrane of claim 26 or 27 and first and second catalysts positioned respectively on opposite surfaces of said membrane.
29. (New) A membrane electrode assembly of claim 28 further comprising a cathode electrode and an anode electrode wherein each of said electrodes is separately in electrical communication with said first and said second catalysts.
30. (New) An electrochemical device comprising the polymer membrane of claim 26 or 27.
31. (New) The electrochemical device of claim 30 comprising a battery.
32. (New) A fuel cell comprising the polymer electrolyte membrane of claim 26 or 27.
33. (New) A fuel cell comprising the membrane electrode assembly of claim 28 or 29.
34. (New) An electronic device comprising the fuel cell of claim 32 or 33.